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XXVI
NOTES ON WEST AMERICAN WHALE BARNACLES

BY
IRA E. CORNWALL

The two whale barnacles, *Coronula diadema*, and *Conchoderma auritum*, have been described by Darwin in his monograph of the Cirripedia, and the shell of *C. diadema* has been described by Dr. H. A. Pilsbry¹, but in neither of these descriptions are the mouth parts and cirri fully figured. This is probably because both species can be recognized by outward form alone. As the whales, and consequently the whale barnacles, are becoming scarcer each year, it seems advisable to describe, and figure these barnacles while they can be obtained. Also, upon examination of specimens it was found that they differed slightly from Darwin's descriptions. The specimens described herein were collected by Captain J. E. Gilmore, of Cachalot, British Columbia, and have been deposited in the Museum of the California Academy of Sciences².

Coronula diadema (Linnæus)

(Plate 13; figures 2-4; text figure 1)

1767. *Lepas diadema* Linnæus, Systema Naturæ, ed. 12, p. 1109 (see Hanley, The Shells of Linnæus, p. 20).
1776. *Lepas balanaris* O. F. Müller, Zoölogiæ Danica Prodrömus, p. 250, No. 3024.

¹U. S. National Museum Bulletin No. 93.

²*Conchoderma auritum*, (pl. 13, fig. 1) is No. 1734 and *Coronula diadema*, (pl. 13, figs. 2-4) is No. 1735 of the collection of type material of the Department of Paleontology.

1778. *Balanus balæna* Da Costa, Hist. Nat. Test. Brit., p. 251.
 1780. *Lepas balænaris* O. Fabricius, Fauna Grœnlandica, p. 425.
 1789. *Balanus diadema* Bruguière, Encyclop. Method., Pl. 164, fig. 13, 14.
 1790. *Lepas balænaris* Gmelin, Systema Naturæ, ed. 13, p. 3208.
 — *Lepas diadema* Chemnitz, Conch., vol. 8, Tab. 99, figs. 843, 844.
 1817. *Diadema vulgare* Schumacher, Essai d'un nouveau Syst. Vers Testaces, p. 91.
 1818. *Diadema candidum* Ranzani, Opuscoli Scientifici, vol. 2, p. 88.
 1818. *Coronula diadema* Linnæus, Lamarck, Hist. Nat. Anim. sans Vert., vol. 5, p. 387.
 1824. *Coronula diadema* De Blainville, Dict. des Sc. Nat. Tab. 117, fig. 4.
 1824. *Coronula diadema* Leach, Encyclop. Brit. Suppl., Vol. iii.
 — *Coronula diadema* Chenu, Illst. Conch., Plate, fig. 3.
 1825. *Polylepas (Diadema) kleinii* Gray, Annals of Philosophy, new ser., vol. 10, p. 105.
 1834. *Coronula diadema* Burmeister, Beiträge zur Naturgeschichte der Rankenfüsser, Tab. 2, fig. 1-14, 18.
 1854. *Coronula diadema* Linnæus, Darwin, Monograph on the Sub-Class Cirripedia, p. 417, pl. 15, figs. 3, 3a, b; pl. 2, fig. 3; pl. 3, fig. 5.
 1870. *Coronula biscayensis* Van Beneden, Bull. de l'Acad. Roy. des Sci. des Lettres, et des Beaux-Arts de Belgique, ser. 2, vol. 29, p. 349. No description.
 1870. ?*Diadema japonica* Van Beneden, Bull. de l'Acad. Roy. des Sci. des Lettres, et des Beaux-Arts de Belgique, ser. 2, vol. 29, p. 354. Also *Diadema californica*, p. 355.
 1874. *Coronula diadema* Linnæus, Scammon, The Marine Mammals of the Northwest Coast of North America, p. 47, pl. 10, fig. 5.
 1897. *Coronula diadema* Linnæus, Weltner, Verzeichnis, Archiv für Naturgeschichte, vol. 1, p. 254 (distribution).
 1900. *Coronula diadema* Linnæus, Weltner, Fauna Arctica, vol. 1, p. 302 (distribution).
 1903. *Coronula diadema* Linnæus, Stead, Proc. Linn. Soc. New South Wales, vol. 28, p. 944.
 1905. *Coronula diadema* Linnæus, Gruvel, Monographie des Cirrhipedes ou Thecostraces, p. 273, text fig. 298, CC.
 1916. *Coronula diadema* Linnæus, Pilsbry, U. S. Nat. Mus. Bulletin 93, pl. 65, figs. 3, 4.

The specimens described were collected from a humpback whale, taken near Cachalot, British Columbia. The one figured on plate measures: diameter 46 mm.; height, 39 mm.

Shape of shell like a cask, the sides being convex; top much smaller than base; shell symmetrical, all six compartments being of same shape; radii forming triangles with their apices at base of shell, their bases forming part of margin of the hexagonal orifice; shell thin; each compartment with four longi-

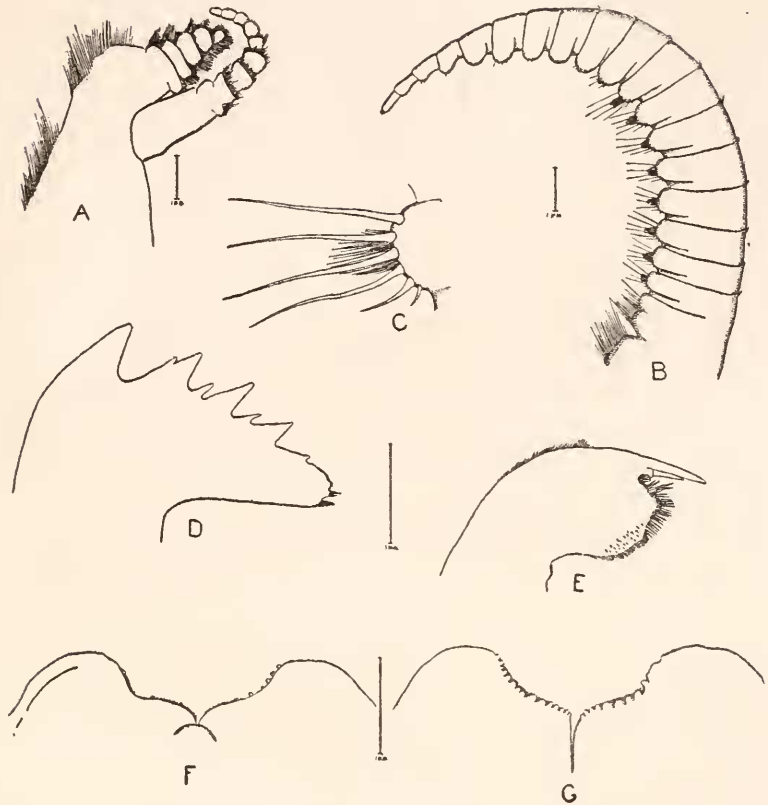


Fig. 1. *Coronula diadema* (Linnæus.) A; cirrus I. B; one ramus of cirrus VI. C; highly magnified view of median segment of cirrus VI. D; mandible. E; maxilla. F; labrum, exterior view. G; labrum, interior view.

tudinal folds; the projections between which are T-shaped, and have their transverse projections firmly pressed together; these 18 cavities are homologous with the longitudinal furrows on the compartments of some of the species of *Balanus*; the transverse portions of these projections forming convex ribs, which increase in number by division, the first to divide being the two marginal ones; ribs marked by fine longitudinal striæ which correspond with the septa between pores which are near the surface; these pores very small and have no cross-septa; the striæ crossed by horizontal growth-lines giving them a beaded appearance. The tops of these ribs are usually worn off, ex-

posing the upper ends of the triangular cavities; these 18 cavities filled by the black skin of the whale; orifice closed by the thick opercular membrane which is attached near top, and nearly horizontal; it is tightly stretched; the opening for the protrusion of the cirri protected by a hood, which is nearer the carina than the rostrum and between it and the rostrum the small scuta can be seen through the membrane; no terga; the basis membranous; the basal opening small, 11 mm. in specimen figured; greatest diameter of orifice is 30 mm. in same specimen; body chamber small; its depth only equal to about half height of shell; it is cup shaped, and when the body has been removed all parts of the chamber can be seen from one point of view. Owing to the structure of the shell there is a wide space between the alæ and the radii, this space filled by the ovarian tubes which enter through the sutures; shell firmly attached by horn-like projections of skin of the whale which fill all the cavities. Shell white, cirri and mouth parts pale yellow.

Cirri (Fig. 1, A-C.), the pedicle of cirrus I is broadened in a peculiar manner, one ramus projecting sidewise from top and the other ramus being attached to edge below other; inner surfaces of first three cirri densely covered with fine spines; cirrus III set in nearer middle line of the animal than I or II and facing more toward mouth. When the first three cirri are slightly bent they form a U-shaped brush with the opening toward the mouth, and anything captured by the six long cirri would be swept into this U when they bend toward the body after each protrusion. The median segment of cirrus VI bears six pairs of spines, the lower pair being very small; in the space between the two rows of spines there is a brush-like group of small spines.

The number of segments in each cirrus is as follows:

Cirrus I,	5—9	Cirrus IV,	15—15
“ II,	6—9	“ V,	15—17
“ III,	9—10	“ VI,	20—21

The cirri are very tough and leathery and show signs of hard usage, many of the distal segments having the spines broken off.

Mandible (fig. 1, D.), Darwin described the mandibles of this species as having five main teeth, but in all the specimens examined from Cachalot, there are only four. On the upper side of the second tooth there is a small projection; between the second and third teeth there is a small tooth, and there is also a small tooth between the third and fourth; below the fourth tooth there is a minute tooth. The inferior angle bears several tufts of small spines, and neither the upper or lower margins have hairs.

Maxilla, (fig. 1, E.). The large spine at the upper angle is not articulated, but is an extension of the body of the maxilla; below this spine and a little to one side of it there is a smaller articulated spine; below this smaller spine there is a deep notch in which there are many fine spines; below the notch the margin forms a prominence; the inferior angle is very broadly rounded. Between the notch and the inferior angle there are two rows of spines, about 25 on each side; part of the upper and lower margins hairy; very small spines on sides of maxilla near inferior angle.

Labrum (fig. 1, F, exterior view; G, interior view), deeply notched, many small teeth set along the edge projecting inward; only a few can be seen from the exterior owing to their position, also there is a dense growth of short hairs over them. The small hard prominence at base of notch, described by Darwin, can be seen in the exterior view.

Branchiæ very greatly developed, occupying a large portion of each side of interior of sack, and almost surrounding the body of the animal; each branchia consisting of two nearly equal parts or folds, each with a tube around the free lower margin; branchiæ deeply plicated, about 15 folds in each half and the surface covered with small round protuberances which still further increase the area.

Conchoderma auritum (Linnæus)

(Plate 13, Figure 1; text figures 2-3)

1758. *Lepas aurita*. "Account of several rare Species of Barnacles," Ellis, "Phil. Trans."

1767. *Lepas aurita* Linnæus, Systema Naturæ, ed. 12, p. 1110.

1795. *Lepas leporina* Poli, Test. utriusque Siciliæ.

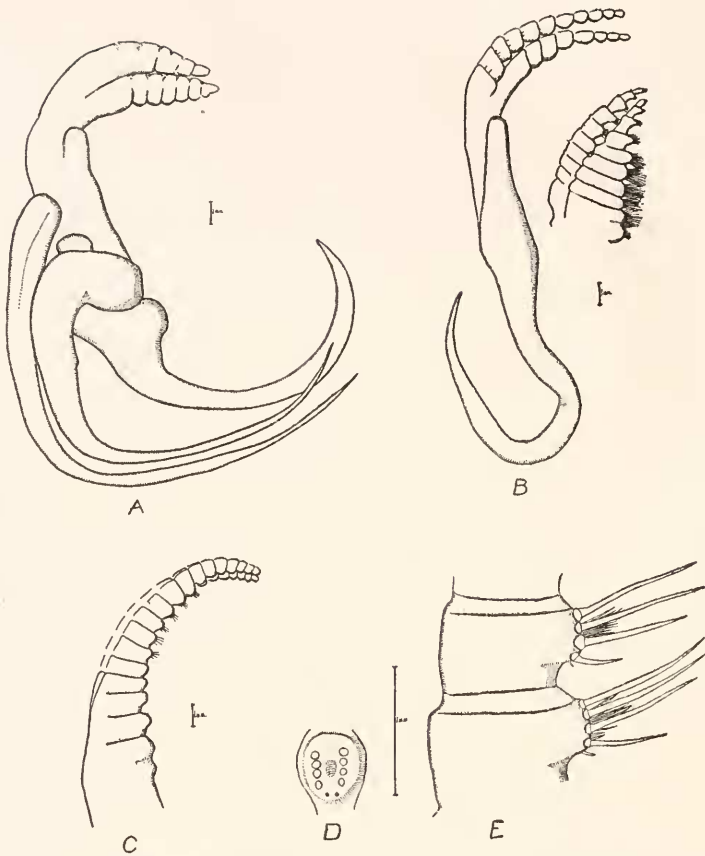


Fig. 2. *Conchoderma auritum* (Linnæus.) A; cirrus I with first, second, and third filamentary appendages attached. B; cirrus II with fourth filamentary appendage attached, also side view. C; cirrus VI. D; margin of median segment of cirrus VI showing position of spines. E; enlarged view of median segments of cirrus VI.

1814. *Conchoderma auritum* et *leporium* Olfers, Magaz. der Gessels. Naturforsch. Freunde, Berlin.
1815. *Lepas cornuta* Montagu, Linnean Transactions.
1815. *Branta aurita* Oken, Lehrbuch der Naturgesch.
1817. *Malacotta bivalvis* Schumacher, Essai d'un nouveau syst. des habitations des Vers.
1824. *Gymnolepas Cuvierii* de Blainville, Dictionnaire des Sciences naturelles.
1824. *Otion Cuvieranus* (!) *Blainvillianus* (!) *Bellianus* (!) *Dumerilianus* (!) *Rissoanus* Leach, Encyclop. Brit., vol. iii, Supp. 1824, and Zoological Journal, vol. ii, p. 208, July 1825. (From Darwin's Monograph.)

1851. *Conchoderma aurita*. Darwin's Monograph on the Sub-Class Cirripedia, the Lepadidæ, p. 141, pl. III, fig. 4.
1905. *Conchoderma auritum* Linnæus, Gruvel, Monographie des Cirrhipèdes au Thecostraces, p. 144, fig. 167.
1907. *Conchoderma auritum* Linnæus, Pilsbry, U. S. Nat. Mus. Bulletin 60, p. 99, pl. IX, fig. 2.

The following description of the genus *Conchoderma*, is from Darwin's Monograph, p. 137 :

"Valves 2 to 5, minute, remote from each other : scuta with two or three lobes, with their umbones in the middle of the occludent margin ; carina arched, upper and lower ends nearly alike. Filaments seated beneath the basal articulations of the first pair of cirri, and on the pedicels of four or five anterior pairs ; mandibles, with five teeth, finely pectinated ; maxilla step-formed ; caudal appendages, none."

The specimens of *Conchoderma auritum* described grew on the shell of *Coronula diadema* and were taken from a hump-back whale at Cachalot, British Columbia.

General appearance: Capitulum 32 mm. in height ; width 23 mm., thickness 16 mm. ; two folded, ear-like appendages 23 mm. long at upper end, these larger than the appendages described by Darwin, and placed in a more erect position ; (fig. 3 E, is a cross-section of these appendages showing how they are folded). The capitulum is supported on the cylindrical peduncle, which, in this specimen, is 39 mm. long and 11 mm. in diameter, expanded at base where it is cemented to the shell of *Coronula diadema*. The capitulum has an opening in the front through which the cirri are protruded ; this opening surrounded by a hood ; below the opening the two small scuta can be seen through the transparent outer layer of the membrane. Color faint pink, with irregular mottled patches of brown on the capitulum ; peduncle irregularly striped with brown ; cirri and trophi white.

Cirri short, very much flattened, tough and leathery ; segments protuberant, especially those of first cirrus ; dorsal tufts of spines at upper angle of each segment short and stout. On median segment of cirrus VI are five pairs of spines, (fig. 2 E), the three distal pairs being large and nearly equal in length, the fourth pair, short and curved, and the fifth pair, minute and set nearer center line of segment than the others ; a brush-

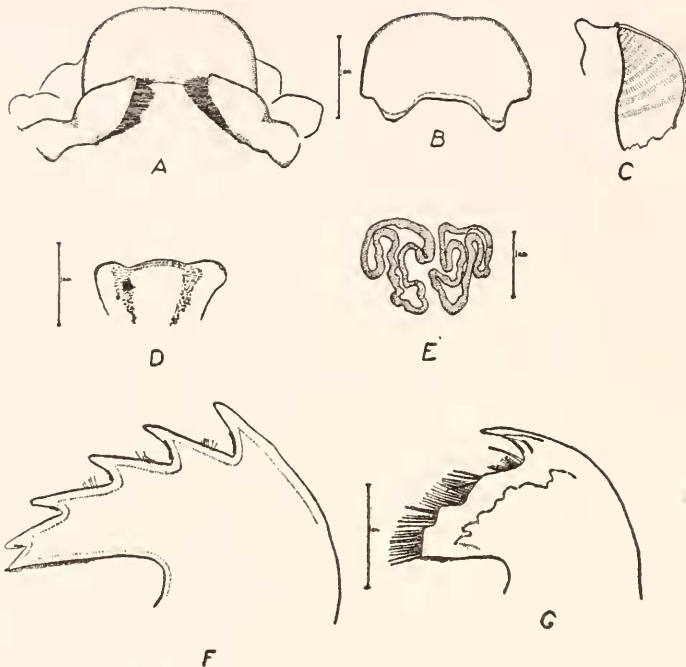


Fig. 3. *Conchoderma auritum* (Linnaeus).—A; labrum viewed from above with palpi in position. B; labrum with palpi removed. C; vertical section through center of labrum. D; interior with two patches of very fine hairs pointing toward center. E; cross-section of ear-like appendages. F; mandible. G; maxilla.

like group of small spines placed centrally between the two rows of main spines (fig. 2 D). Cirri I and II have a dense growth of fine spines on their ventral margins.

Filamentary appendages more highly developed than in any other cirripede; first two attached below pedicle of first cirrus, the third attached to its margin (fig. 2 A); the fourth, fifth, sixth, and seventh attached to the second, third, fourth, and fifth cirri, respectively. Cirrus VI has no appendage attached to its pedicle; no caudal appendages.

Mandible (fig. 3 F), with five teeth which are nearly equally spaced; the inferior angle sharply pointed and bearing a minute spine; tufts of fine hairs between first four teeth, and on each side of the teeth, near their bases, there are very minute trans-

parent teeth; the upper and lower margins bear many fine short hairs.

Maxilla (fig. 3 G) is of a peculiar shape and somewhat resembling a mandible as the margin retreats from the inferior angle; also the two large spines at the upper angle are set on a broad base, the larger of these spines next to the mandible, both of the large spines pectinated near their bases in the same manner as the spines on mandible. In the hollow, or broad notch, below the two large spines, a long slender spine and a few small ones, the margin below the broad notch forming three steps. In Darwin's Monograph the maxilla is described as having five steps. These steps bear a dense growth of spines, the inferior angle is almost square and there are short hairs on the lower margin, with a few on the upper margin.

Labrum (Fig. 3 A,B,C,D), of the usual shape and on the crest there is a row of fine inwardly pointing teeth, with some very fine hairs.

Plate 13

Fig. 1. *Conchoderma auritum* (Linnæus), growing on shell of *Coronula diadema* (Linnæus.) Natural size.

Figs. 2-4. *Coronula diadema* (Linnæus.) Natural size.



Fig. 1



Fig. 3

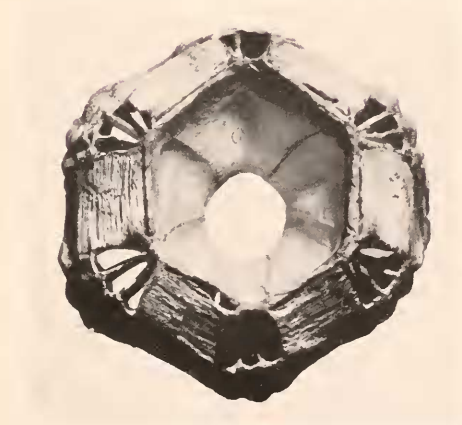


Fig. 2

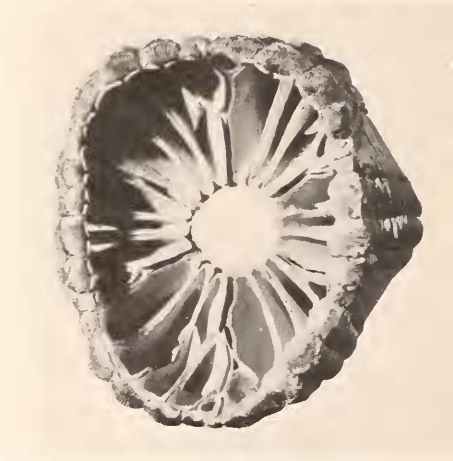


Fig. 4